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2.1 CELL STRUCTURE

Prokaryotic Cells

Structures and functions

- May contain genes for antibiotic resistance
- Plasmids – small strands of DNA
- Cell wall containing murein (peptidoglycan)
- 70S Ribosomes
- Circular DNA, no associated proteins, no nucleus
- Cell membrane
- Capsule – prevents phagocytosis
- Flagella – for motility

No membrane-bound organelles

- Much smaller than eukaryotic cells

Bacterial cells range from 0.1–10 μm; viruses range from 20–300 nm

Eukaryotic Cells

Prokaryotic ribosomes are smaller than eukaryotic ribosomes

Important difference

Structures and functions

- 80S Ribosomes – protein synthesis
- Nucleus – contains protein-bound, linear DNA
- Cell wall (plants, algae, fungi) – mechanical strength
- Cellulose
- Cell membrane – regulates passage of substances into cells
- Lysosomes – removes bacteria and dead cells/material
- Mitochondria – site of respiration
- Chloroplasts (plants and algae) – for photosynthesis
- Golgi apparatus and vesicles – modifies and transports molecules
- Vacuole (plants) – contain sugars/amino acids
- Smooth endoplasmic reticulum – lipid/carbohydrate synthesis
- Rough endoplasmic reticulum – protein synthesis and transport

Viruses

- Capsid coat
- Extremely small
- Contain nucleic acids (DNA or RNA)
- Lipid envelope or attachment proteins
- Acellular and non-living

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2.1.3 METHODS OF STUDYING CELLS

Optical Microscopy

- Light rays can distinguish between objects 0.2 μm apart
  - 0.2 μm is the resolution/resolving power
- Resolution/resolving power = distance between objects that allows them to be seen as 2 objects
- Using light rays and lenses to magnify images
- Magnification = (size of image) ÷ (size of real object)
  - Image = appearance in the microscope

Electron Microscopy

Electron microscopes have much better resolving power (0.1nm)

- Transmission electron microscope (TEM)
  - Can see through specimen
  - Thin section
  - Flat, 2D image
  - Specimen must be in a vacuum
  - Artefacts
- Scanning electron microscope (SEM)
  - Less resolving power than TEM
  - 3D image
  - May use false-colour

Cell fractionation

- Cold, isotonic, buffered solution
  - Cold = reduce enzyme activity
  - Isotonic – prevent organelles shrinking/bursting
  - pH buffer – prevent protein denaturation
- Ultracentrifugation
  - Heaviest organelles in the pellet
    - Nuclei and mitochondria
  - Re-spin supernatant
- Cells broken up, organelles removed
  - Homogenisation
  - Allows us to study organelles

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